

Issued by

NMi Certin B.V.

In accordance with

- WELMEC 8.8 "General and Administrative Aspects of the Voluntary System of Modular Evaluation of Measuring instruments under the MID".
- OIML R117-1 Edition 2007 (E) "Dynamic measuring systems for liquids other than water".

Producer

Endress + Hauser Flowtec AG
Kägenstrasse 7
CH-4153 Reinach
Switzerland

Part

A **flow transmitter** (calculating/indicating device for Endress + Hauser Coriolis meters), intended to be used as a part of a measuring instrument.
Producer's mark or name : Endress + Hauser Flowtec AG
Type designation : Promass 84
Accuracy class : 0.3

Further properties and test results are described in the annexes:

- Description TC7151 revision 9;
- Documentation folder TC7151-4.

Remark

- This revision replaces the previous revisions;
- The documentation folder is not changed.

Issuing Authority

NMi Certin B.V., Notified Body number 0122
10 December 2021

Certification Board

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1 General information about the flow transmitter

Properties of this flow transmitter, whether mentioned or not, shall not conflict with the legislation.

This Evaluation Certificate is the positive result of the applied voluntary, modular approach, for a component of a measuring instrument, as described in WELMEC 8.8.

The complete measuring system must be covered by relevant metrological certification that is valid in the country where the instrument is put into use.

This Evaluation Certificate is valid for the Endress + Hauser flow transmitter, as described in paragraph 1.1 of the description and may only be used in combination with Coriolis measurement sensors manufactured by Endress + Hauser Flowtec AG:

- that are covered by an Evaluation Certificate;
- directly mentioned in the EC-Type Examination Certificate or EU-Type Examination Certificate of the measuring system.

1.1 Essential parts

1.1.1 The flow transmitter is composed of the following parts:

Description		Documentation	Remarks
Power supply	85 – 260 V AC	7151/4-11, 7151/4-12, and 7151/5-02.	See documentation folder under heading "Power Supply"
	16 – 62 V DC / 20 – 55 V AC	7151/4-13, 7151/4-14, and 7151/5-03.	
Generic printed circuit boards for power supply.		7151/4-10 and 7151/5-01.	An exploded view of the different printed circuit boards is presented, this Layout is compatible for all versions of power supply.
Amplifier module	Version V02	7151/4-15, -16, -17, -18, -19 and -20.	See documentation folder under heading "Amplifier"
	Version V14	7151/4-21, -22, 7151/5-04 and -05.	
Communication module ¹		7151/4-23, -24, -25, -26, -27, -28, -29, -30, -31, -32, 7151/5-06, -07, -08 and -09.	See documentation folder under headings "IO Module" and "Sub modules to the IO Module"

¹ The communication module performs all communication between the Amplifier module, which integrates also the display and the outside world.

- 1.1.2 Indicating device (Optional)
LCD display with four lines for displaying (alpha) numeric data.
- 1.1.3 Inputs (sensor side)
From the connected Coriolis sensor, the Promass 84 receives:
- Two pick-off signals; analogue mV signals from which the mass flow and density are determined
 - One two-wire Pt-1000 temperature transmitter for the measurement of the tube temperature
 - One two-wire Pt-1000 temperature transmitter for the measurement of the carrier tube temperature.
- Please note that these temperatures shall not be used for Custody Transfer related purposes, but only for the correction given above.
- 1.1.4 Outputs (sensor side)
The Promass 84 uses an alternating current to set the sensor's measurement tubes in a vibrating motion. The frequency of the vibration is automatically adjusted to the resonant frequency of the measurement tubes filled with liquid. This output is referred to as:
- Drive current output.
- 1.1.5 Input/output (electronic calculator/indicating device)
The Promass 84 is equipped with the following Custody Transfer outputs:
- Double, 90° or 180° phase shifted pulse-output for the transmission of volume- or mass-information. Phase shift is selectable
 - 4 – 20 mA output for the transmission of density. This output can also be used for input/output via Hart protocol.
 - Status input or status output (depending on version)
 - Modbus RS485 serial protocol. Data transmission is safe guarded with CRC checksum over the data package.
- Note: With the Modbus output the Promass 84 has only a single channel pulse output. This pulse output may not be used for custody transfer of measurement data.
- 1.1.6 Custody Transfer software
- Mass determination
 - The time shift between the two pick-off signals is representative for the mass flow through the connected measurement sensor.
 - Density determination
 - From the resonant frequency of the measurement tubes, the Promass 84 determines the density of the liquid flowing through the sensor. The frequency of the measurement tubes is sent to the Promass 84 by the pick-off coils.
 - Volume determination.
 - From the measured mass and density, the Promass 84 calculates the volume of the liquid flowing through the sensor.
 - Corrections.
- The Promass 84 automatically corrects for temperature effects on the sensor's measurement tubes, using the read-out of the sensor's internal temperature transmitter.

1.2 Essential characteristics

1.2.1 Temperature range ambient
 - -40 °C / +55 °C

1.2.2 Environment classes
 - M3 / E3 / H3

1.2.3 Minimum measured quantity
 The minimum measured quantity is not smaller than the largest of the following values:
 - the minimum measured quantity of the connected sensor
 - 200 times the unit of indication of the Promass 84
 - 200 times the unit of indication of the connected electronic calculator/indicating device, if applicable
 - 200 times the unit of printing, if applicable.

1.2.4 Software versions

Part	Version numbers	Remarks
V02 Amplifier	V2.00.xx; V2.01.xx; V2.02.xx	-
V14 Amplifier	V3.00.xx; V3.01.xx	-
Communication	V1.04.xx; V1.05.xx; V1.06.xx V3.03.xx; V3.04.xx; V3.06.xx	-

Communication Device software		Checksums for region code			
Protocol	Version	WEA	SEA	EES	CN
HART	V3.01.xx	0xA522211E/ 0x58E28A69	0xFDDE4E31/ 0x58E28A69	0x7C2AEBEC/ 0x58E28A69	0x4918A098/ 0x58E28A69
		0x1C533108/ 0x0A34FC6D	0x691FCFD0/ 0x0A34FC6D	0xEE52188D/ 0x0A34FC6D	0xAF4A3246/ 0x0A34FC6D
		0x1C533108/ 0x210700CA	0x691FCFD0/ 0x210700CA	0xEE52188D/ 0x210700CA	0xAF4A3246/ 0x210700CA
Modbus	V3.06.xx	0xC79A65ED/ 0xA522211E	0xC79A65ED/ 0xFDDE4E31	0xC79A65ED/ 0x7C2AEBEC	0xC79A65ED/ 0x4918A098
		0xC79A65ED/ 0x1C533108	0xC79A65ED/ 0x691FCFD0	0xC79A65ED/ 0xEE52188D	0xC79A65ED/ 0xAF4A3246

Note: xx represents non-Custody Transfer software modifications.

The software number can be displayed through the menu system of the Promass 84;

- enter the submenu's "SUPERVISION" – "VERSION-INFO" – "AMPLIFIER"; the second item in this menu is called "SW-REV. AMP" and displays the Amplifier software version.
- enter the submenu's "SUPERVISION" – "VERSION-INFO" – "I/O MODULE"; the second item in this menu is called "SW-REV.I/O" and displays the Communication software version.



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- 1.2.5 Custody Transfer parameters
The Custody Transfer parameters and the mandatory settings are mentioned in Documentation number 7151/4-01.

1.3 Essential shapes

1.3.1 Inscriptions Promass 84

On the flow transmitter, clearly visible, at least the following is inscribed:

- At least the inscription "TC7151" is placed on the models mentioned in paragraph 1.1.
- Identification of the measurement sensor.
- Close to the display of the Promass 84, the minimum measured quantity.
- In case of a remote version: the serial number of the measurement sensor is inscribed on the Promass 84 and/or the serial number of the Promass 84 is inscribed on the measurement sensor.

The region code and the corresponding software version and checksums are inscribed on the instrument for as concerning the versions mentioned in the second table of "essential characteristics" – "software versions".

See documentation number 7151/4-02 for an example of the markings.

1.3.2 Status of the device

In case an electronic calculator/indicating device is connected to the Promass 84, the Promass' status is sent to the connected device in one of the following ways:

- The Promass' status output is connected directly to the flow computer
- The Promass' status output interrupts one of the pulse-channels, thus enabling the flow computer to detect a pulse failure and consequently generate an alarm. If necessary, an extra electrical board is added to prevent this action short-circuiting the Promass 84.
- The current output is set to failure current (minimum or maximum value is possible), thus enabling the flow computer to detect the failure.
- The Promass' pulse output is set to maximum pulse rate for one channel and to no pulses for the other pulse channel. This will trigger the pulse security checking of the connected electronic calculator/ indicating device.
- The Promass' status information is available via MODbus.

In all cases the status of the device must be configured so, that the alarm conditions "Failure" and "Empty Pipe" are sent to the connected device.

1.3.3 Sealing

See chapter 2.



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1.4 Conditional parts

1.4.1 Keyboard

The keyboard consists of three keys of which their function depends on the menu and selected item. The keyboard is part of the LCD display. If the display is not present, the keyboard is also not present.

1.4.2 Housing

Inside the metal housing the Promass, the essential and the conditional parts are mounted. Access can be obtained through two sealable lids.

There are four versions of the housing:

- compact, explosion proof
- compact, non-explosion proof
- remote, explosion proof
- remote, non-explosion proof

The compact versions are mounted directly on top of the measurement sensor; the remote versions are connected to the sensor by means of a cable of maximum 20 metres in length.

1.4.3 EEPROM

- S-DAT (blue chip) contains all sensor data.
- T-DAT (black chip) back up of all application data.

1.5 Conditional shapes

1.5.1 Blinding of Promass display

If an electronic calculator/indicating device (flow computer) is connected to the Promass 84, the display (when present) of the Promass 84 may be blinded. The display is still present and functioning although it is not possible to read the display.

2 Seals

After setting the Promass 84 in Custody Transfer mode, the housing of the flow transmitter is sealed against unauthorised opening.
See documentation number 7151/4-07.

3 Conditions for conformity assessment

- Other parties may use this Evaluation Certificate only with the written permission of the producer.
- Cabling
 - Cabling has to be in accordance with manufacturer installation instructions.



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- Amplifier replacement
 - Both amplifiers are interchangeable. Meaning a defect amplifier board can be replaced with the same type (V02 replaced with V02) or with the other type (V02 type replaced with V14 type). Replacing the amplifier board requires breaking of the sealing.
 - If the amplifier has been replaced, the correct setting of the zero-point has to be verified.

4 Reports

An overview of the performed tests is given in Evaluation Report ER7151 revision 9 issued together with this Evaluation Certificate.



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To whom it may concern

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CH-4153 Reinach, 5 February 2016

Concerning Mandatory Parameter Settings Promass 84

The attached Mandatory Parameter Settings 7151/4-01 are only relevant in combination with Evaluation Certificate TC7151 Revision 6 (or higher) for Coriolis mass flow meter Promass 84 when used as a part of a “measuring system for the continuous and dynamic measurement of quantities of liquids other than water” (under the scope of the European Directive 2004/22/EC Annex MI-005) in the Member States of the EU.

These Mandatory Parameter Settings are referenced in TC7151 chapter 1.2 “Essential Characteristics – Custody Transfer parameters”.

This document is provided here as a guidance for the applicant of such a measuring system.

Yours sincerely,

Wilhelm Staudt



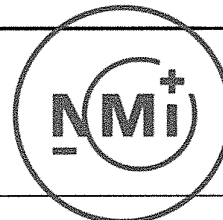
Mandatory Parameter Settings Promass 84

General demands:
Insignificant scale intervals should be avoided.

Mandatory settings:

Menu	Sub menu 1	Sub Menu 2	Parameter	Param. no.	Mandatory setting
CUSTODY TRANSFER	-		CUSTODY TRANSFER	Z000	YES (1) (Ampl. software V2.00.xx ⁽¹⁾)
			PULS.OUTP.1 C.T.	Z001	CUSTTR.ON (1) (from Ampl. software V2.01.xx ⁽¹⁾)
			PULS.OUTP.2 C.T.	Z002	YES, if needed (2) (3)
			CURR.OUTP.1 C.T.	Z003	YES, if needed (2) (3)
			TOTALIZER 1, 2, 3 C.T.	Z006, Z007, Z008	YES, if needed for Density YES, if needed (4) (3)
MEASURED VARIABLE	SYSTEM UNITS	CONFIGURATION	UNIT MASS FLOW	0400	Metrical units (example kg/min)
			UNIT MASS	0401	t, kg or g
			UNIT VOLUME FLOW	0402	Metrical units (example m ³ /h)
			UNIT VOLUME	0403	m ³ , dm ³ , cm ³ , l or ml (3)
		UNIT DENSITY	0420	Metrical units (example kg/l)	
		UNIT TEMPERATURE	0422	°C	
		UNIT LENGTH	0424	MILLIMETRE	
		UNIT PRESSURE	0426	BAR A or BAR G	
		ADDITIONAL CONF.			

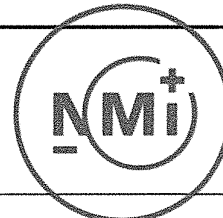
⁽¹⁾ xx represents non Custody Transfer software modifications.





Mandatory Parameter Settings Promass 84

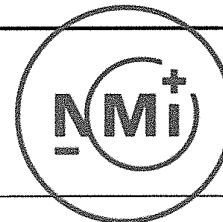
Menu	Sub menu 1	Sub Menu 2	Parameter	Param. no.	Mandatory setting
MEASURED VARIABLE USER INTERFACE TOTALIZERS (if used)	SYSTEM UNITS	ARBITRARY UNIT	MUST BE EXPRESSED IN METRICAL UNITS IF USED		
	CONTROL	BASIC CONFIG.	LANGUAGE	2000	Local language (preferred); ENGLISH
	TOTALIZER 1, 2, 3	CONFIGURATION	ASSIGN	3000	MASS FLOW or VOLUME FLOW
OUTPUT	HANDLING TOTALIZER	-	UNIT TOTALIZER	3001	t, kg or g resp. m ³ , dm ³ , cm ³ , l or ml
			TOTALIZER MODE	3002	(5)
			FAILSAFE ALL TOT	3801	STOP
			OPERATION MODE	4200	PULSE
	PULS/FREQ.OUT. 1	CONFIGURATION	ASSIGN PULSE	4221	MASS FLOW OR VOLUME FLOW
			PULSE VALUE	4222	(6)
			PULSE WIDTH	4223	(7)
			MEASURING MODE	4225	In accordance with calibration data
			FAILSAFE MODE	4227	MAX. PULSE RATE
			SIMULATION PULSE	4322	OFF
	PULS/FREQ. OUT. 2	CONFIGURATION	OPERATION MODE	4200	DOUBLE PULSE C.T (\$)
			ASSIGN CURRENT	4000	DENSITY (9)
	CURRENT OUTPUT 1	CONFIGURATION	VALUE 0_4MA	4002	(10)
			VALUE 20MA	4003	(10)
MEASURING MODE			4004	STANDARD	
FAILSAFE MODE			4006	MIN OR MAX CURRENT	





Mandatory Parameter Settings Promass 84

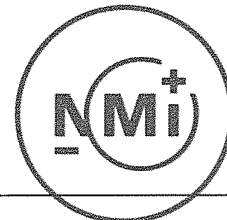
Menu	Sub menu 1	Sub Menu 2	Parameter	Param. no.	Mandatory setting
OUTPUT BASIC FUNCTION	CURRENT OUTPUT 1	OPERATION	SIMULATION CURR.	4041	OFF
	PROCESSPARAMETER	CONFIGURATION	ON-VALLF-CUTOFF	6402	$\leq 0,2 \times Q_{min}$ (11)
			OFFVAL.LF-CUTOFF	6403	Value should be such that the resulting flowrate $\leq 0,2 \times Q_{min}$ (12)
		EPD PARAMETER	EMPTY PIP DET.	6420	ON (13)
	SYSTEM PARAMETER	CONFIGURATION	INSTL.DIR.SENSOR	6600	In accordance with calibration data
	SENSOR DATA	CONFIGURATION	K-FACTOR	6800	In accordance with calibration data
			NOMINAL DIAMETER	6804	In accordance with the sensor size.
			KM	6840	In accordance with the sensor type and size.
			KM2	6841	These parameters can be displayed, but cannot be modified.
			KT	6842	
			KD1	6843	
			KD2	6844	
		DENSITY COEF.	C0	6850	In accordance with calibration data. These parameters cannot be edited. However they can be modified by a field density calibration.
			C1	6851	
			C2	6852	
		C3	6853		
		C4	6854		
		C5	6855		





Mandatory Parameter Settings Promass 84

Menu	Sub menu 1	Sub Menu 2	Parameter	Param. no.	Mandatory setting
SUPERVISION	SYSTEM	CONFIGURATION	ALARM DELAY	8005	0 S
		OPERATION	SIM.FAILSAFEMODE	8042	OFF
			SIM.MEASURAND	8043	OFF





Mandatory Parameter Settings Promass 84

Notes to the mandatory parameter settings:

- (1) The Promass 84 is set to Custody Transfer mode as follows:
Enter the code number "8400" into the parameter: "USER INTERFACE" – "CONTROL" – "UN-/LOCKING" – "ACCESS CODE 2020".
From Amplifier Software V2.01.xx and higher the Promass 84 shows this parameter setting during reboot. Also CUSTTR.ON is displayed directly after input of the custody transfer code.
- (2) For Mass flow or Volume flow.
- (3) Not all Coriolis sensors are allowed to measure volume. See the applicable Evaluation Certificate or EC type examination certificate.
- (4) For local totalisation of mass flow or volume flow.
- (5) At least one of the totalizers must be in accordance with the calibration data.
- (6) Pulse value should be such that one pulse is not smaller than the smallest unit of indication or the smallest unit printed (in case a printer is connected to the measuring system). Also the pulse value should have such a value that the pulse frequency does not exceed 5000 Hz (maximum output frequency of the Promass 84) and does not exceed the maximum input frequency of the connected electronic calculator/indicating device.
- (7) The pulse width should be such that the outputted pulses can still be processed by the connected electronic calculator/indicating device.
- (8) This setting is only mandatory if the pulses from the Promass 84 are used to transmit the measurement result to another system (for example a flowcomputer) where the counted pulses are used as basis for a Custody Transfer delivery.
In this configuration the second pulse output runs with the same configuration as the first one, but the pulses are 90° shifted. The failsafe mode is FALLBACK VALUE. So in case of an error the first channel goes to maximum pulse rate and the second channel goes to zero pulses, this will lead to a pulse security error on the connected system.
- (9) If used
- (10) Minimum and maximum values should be such that the achieved accuracy fulfils the OIML requirement on density: 1 kg/m³.
- (11) This is the flow rate at which the low-flow-cut-off is activated, eg. Pulse output is stopped.
- (12) This is the value at which the low-flow cut-off is deactivated, eg. Pulse output is started. The value is entered as a percentage (0 .. 100%) of the ON-VAL.LF-CUTTOFF parameter.
Actual value = ON-VAL.LF-CUTTOFF x (1 + OFFVAL.LF-CUTOFF/100). If the actual flow rate is higher than 20% of Qmin pulses should be outputted by the Promass 84.
- (13) The parameters "EPD VALUE LOW 6423" and "EPD VALUE HIGH 6424" should be such that product densities outside the expected range (specially low density) are detected and generate an alarm.

